

**What is claimed is:**

1           1.    A feedback control I/O buffer driven by a system  
2    voltage, comprising:  
3           an input/output circuit comprising a first PMOS  
4           transistor and a first NMOS transistor and having  
5           an I/O port coupled to an I/O pad, wherein the first  
6           PMOS transistor has an N-well region, a gate of the  
7           first NMOS transistor receives a first gate control  
8           signal, and a drain of the first PMOS transistor  
9           serves as the I/O port;  
10          a N-well control circuit coupled to I/O pad to control  
11          the voltage level at the N-well region of the first  
12          PMOS transistor according to the feedback signal  
13          output from the inverter; and  
14          a P-gate control circuit receiving a second gate control  
15          signal and being output to the gate of the first  
16          PMOS transistor, wherein the P-gate control  
17          circuit comprises:  
18          a transmission gate having a second NMOS transistor  
19          and a second PMOS transistor, the sources of  
20          which are coupled to the second gate control  
21          signal, and the gates of which are coupled to  
22          the system voltage and the N-well control  
23          circuit respectively; and  
24          a third PMOS transistor having a drain and a source  
25          coupled to the gate and the floating N-well  
26          region of the first PMOS transistor  
27          respectively, and a gate coupled to the system  
28          voltage.

1           2.    The feedback control I/O buffer as claimed in Claim  
2    1, wherein the N-well control circuit adjusts the voltage  
3    level at the N-well region of the first PMOS transistor to  
4    the voltage level of the input voltage when the input voltage  
5    exceeds the system voltage.

1           3.    The feedback control I/O buffer as claimed in Claim  
2    2, wherein the N-well control circuit adjusts the voltage  
3    level at the N-well region of the first PMOS transistor to  
4    the voltage level of the system voltage when the input voltage  
5    is lower than the system voltage.

1           4.    The feedback control I/O buffer as claimed in Claim  
2    1, wherein the input/output circuit further comprises a fourth  
3    NMOS transistor having a source and drain coupled to the I/O  
4    pad and the drain of the first NMOS transistor respectively,  
5    and a gate coupled to the system voltage.

1           5.    The feedback control I/O buffer as claimed in Claim  
2    4, wherein the N-well control circuit comprises:

3           a fourth PMOS transistor having a source coupled to the  
4           I/O pad, a gate coupled to the system voltage, and  
5           a drain coupled to the N-well region of the first  
6           PMOS transistor;

7           a fifth PMOS transistor having a gate coupled to the  
8           system voltage, a source coupled to the I/O pad,  
9           and a drain;

10          a sixth PMOS transistor having a gate coupled to the drain  
11          of the fifth PMOS transistor, a drain coupled to  
12          the system voltage, and a source coupled to the  
13          N-well region of the first PMOS transistor; and

14           a fourth NMOS transistor having a source and drain  
15               coupled to the I/O pad and the gate of the sixth  
16           PMOS transistor, and a gate coupled to the system  
17           voltage.

1           6.    An input/output buffer, comprising:  
2           a floating N-well;  
3           a first NMOS transistor having a gate coupled to a first  
4               gate control signal, and a source coupled to the  
5               ground;  
6           a second NMOS transistor having gate coupled to a system  
7               voltage, a source coupled to a drain of the first  
8               NMOS transistor and a drain coupled to an I/O pad;  
9           a third NMOS transistor having a gate coupled to the  
10               system voltage, and a drain coupled to the I/O pad;  
11           a first PMOS transistor having a source coupled to the  
12               system voltage, and a drain coupled to I/O pad;  
13           a second PMOS transistor having a source coupled to the  
14               I/O pad, a gate coupled to the system voltage, and  
15               a drain coupled to floating N-well;  
16           a third PMOS transistor having a source coupled to I/O  
17               pad, a gate coupled to the system voltage, and a  
18               drain coupled to a source of the third NMOS  
19               transistor;  
20           a fourth PMOS transistor having a gate coupled the drain  
21               of the third PMOS transistor, a drain coupled to  
22               the system voltage, and a source coupled to the  
23               floating N-well;  
24           a transmission gate including a fifth PMOS transistor  
25               and a fourth NMOS transistor, wherein the sources

26                   of which are coupled to a second gate control  
27                   signal, the drains of which are coupled to the gate  
28                   of the first PMOS transistor, and the gates of which  
29                   are coupled to a drain of the third PMOS transistor  
30                   and the system voltage respectively; and  
31                   a sixth PMOS transistor having a gate coupled to the  
32                   system voltage, a drain coupled to the gate of the  
33                   first PMOS transistor and a source coupled to the  
34                   floating N-well and the source of the fourth PMOS  
35                   transistor; wherein the floating N-well is  
36                   connected to the substrate on which the first to  
37                   sixth PMOS transistors are formed.